#9
R. Miller
03/04/03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:		:	
	Gerald D. Sauder et. al	:	Group Art Unit: 3654
Serial No.:	09/841,473	:	Examiner: Katherine A. Matecki
Filed:	April 24, 2001	:	

Title: TAKE-UP REEL WITH UNI-DIRECTIONAL SPEED GOVERNED RETRACTOR

DECLARATION UNDER 37 C.F.R. § 1.131

Commissioner of Patents and Trademarks
BOX AMENDMENT – NO FEE
Washington, D.C. 20231

Sir:

1. We, the undersigned are co-inventors of claims 1-20 of the patent application identified above and of the subject matter described and claimed therein. All acts described herein as being carried out by us, were carried out in the State of Arizona, United States of America.

2. Prior to December 3 1998, we conceived of the idea of using a unidirectional viscous damper to retard the retraction speed of a hose reel as disclosed and claimed in the above-identified application. A scale drawing of the concept was prepared by Mr. Baca on December 3, 1998 (copy attached hereto as Exhibit A). Additional drawings were prepared by Mr. Baca on December 17, 1998 and December 22, 1998 (copies attached hereto as Exhibit B)

3. On December 4, 1998, Mr. Sauder sent a copy of a drawing outlining the area available for a damper to Ace Controls along with a facsimile request for Ace Controls to cooperate with us in the design of a viscous damper for the hose reel. (Exhibit C). Ace Controls responded by facsimile dated December 4, 1998 saying they were interested. (Exhibit D).

4. On December 8, 1998, Mr. Sauder provided design specification information to Ace controls (Exhibit E).

5. On January 18, 1999, Mr. Sauder provided additional design information to Ace Controls (Exhibit F).

6. During the month of February 1999, Mr. Sauder investigated the availability of silicone fluids for use in the viscous damper as well as possible use of plastic materials to construct the damper, as recorded in the progress reports of Mr. Sauder. (Exhibit G).

7. On March 3, 1999 the Cox Reels purchasing department, under the direction of Mr. Sauder issued a purchase order for two Torrington roller clutches for the prototype reel. (Exhibit H).

8. By March 8, 1999, a prototype had been completed as recorded in the progress reports of Mr. Sauder. (Exhibit G)

9. By March 17, 1999, parts for additional prototypes had been ordered and were under construction as recorded in the progress reports of Mr. Sauder. (Exhibit G).

10. By March 19, 1999, the machined parts had been received and additional parts for the viscous damper were being fabricated. (Exhibit I).

11. On March 24, Mr. Baca sent facsimile requests to three plastic mold companies requesting quotes for manufacturing certain of the parts for the viscous damped reel. (Exhibit J).

12. By March 29, 1999 Mr. Baca had prepared detailed drawings of the hose reel retractor incorporating a one-way roller clutch. (Exhibit K)

13. By March 26, 1999, a second prototype was completed and tested as reported by Mr. Sauder in a memorandum to Don Cox. (Exhibit L).

14. Mr. Sauder conducted tests of the damper in various models of hose reels on April 8, 1999, April 12, 1999, and April 22, 1999. The test notes and test data sheet are attached

hereto as Exhibit M. As evidenced by Exhibit M, as early as April 8, 1999, the model 1449 hose reel retractor produced an acceptable unidirectional damping, indicating to us a successful demonstration of the invention.

The undersigned being duly warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon hereby declares that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true.

Gerald D. Sauder — 2/10/03

Gerald D. Sauder — Date

Andre J. Baca — 2-14-03

Andre J. Baca — Date

Jeff ~~Knossala~~ Knosalla — 2-12-03

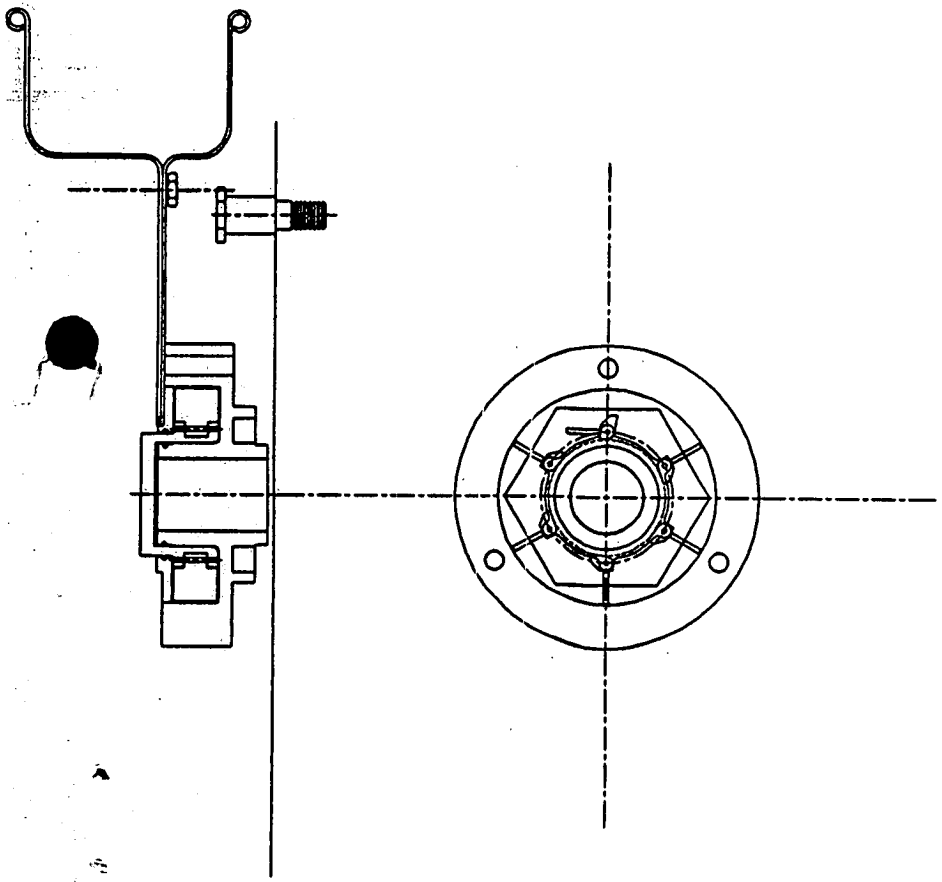
Jeff ~~Knossala~~ Knosalla — Date

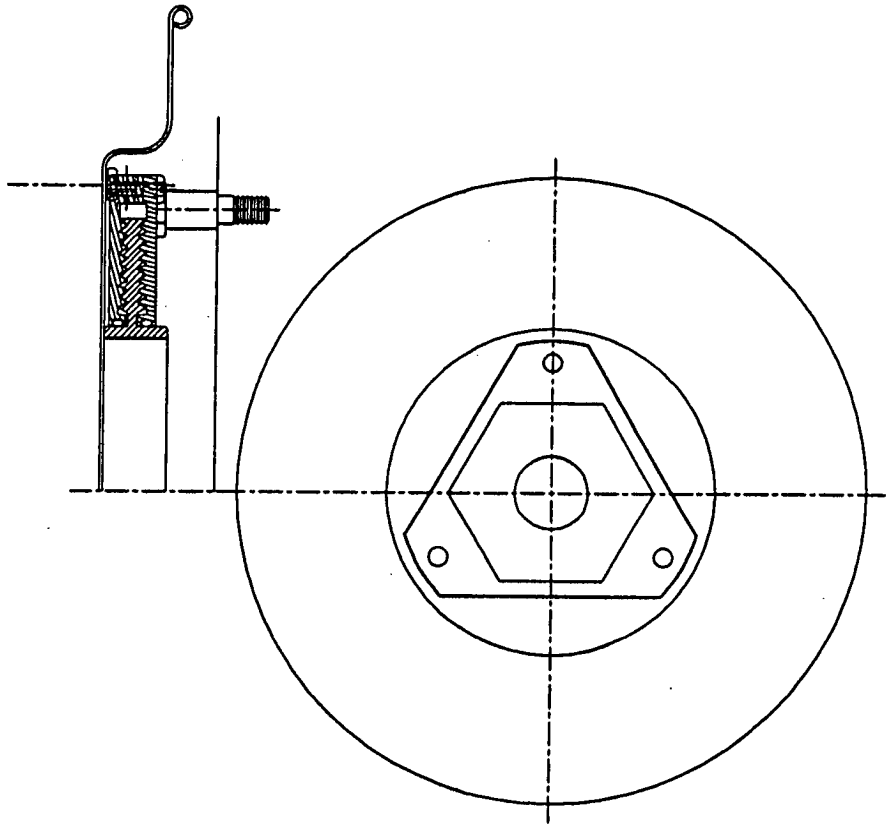
CAVPHXDB:989705.1

EP-024

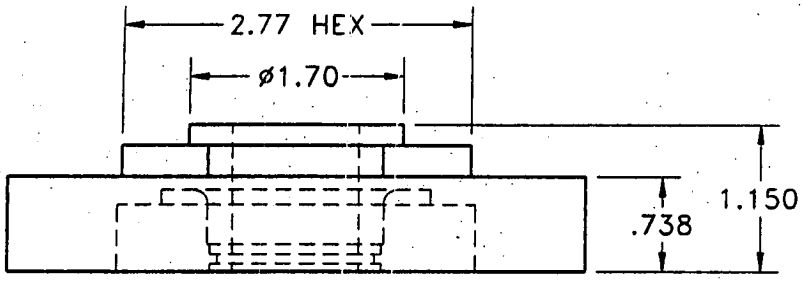
EARLY DESIGN CONCEPTS

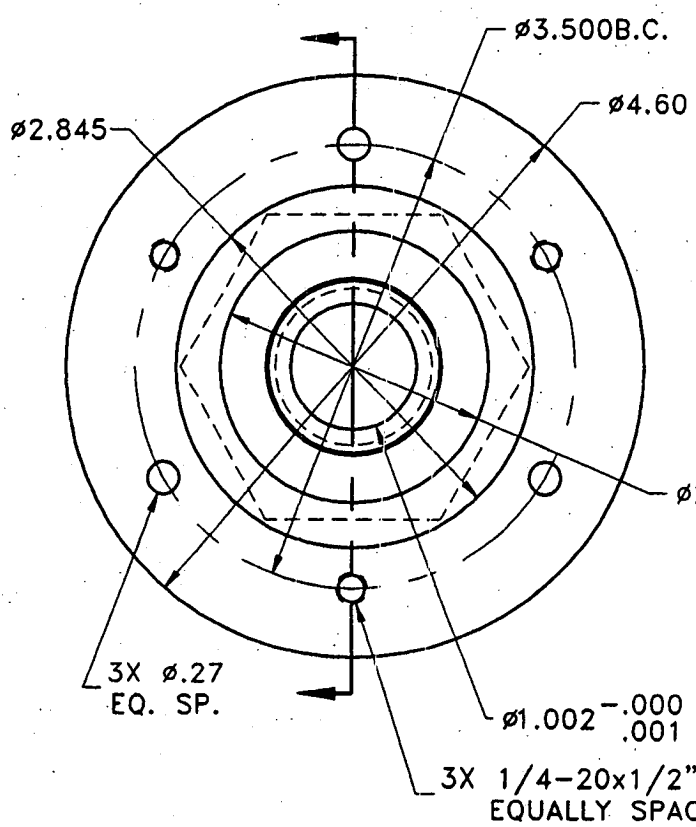
LAST SAVED 12/3/1998

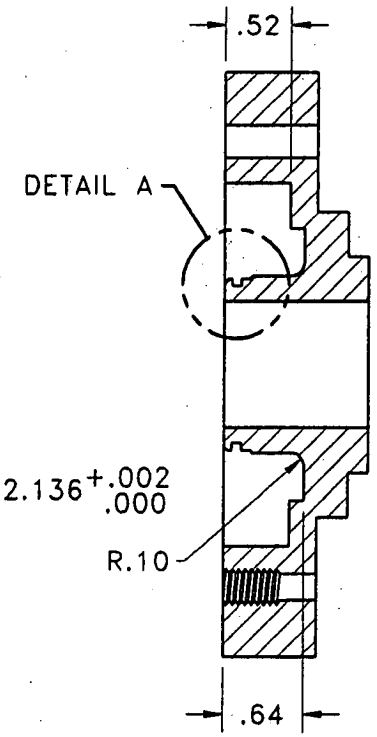


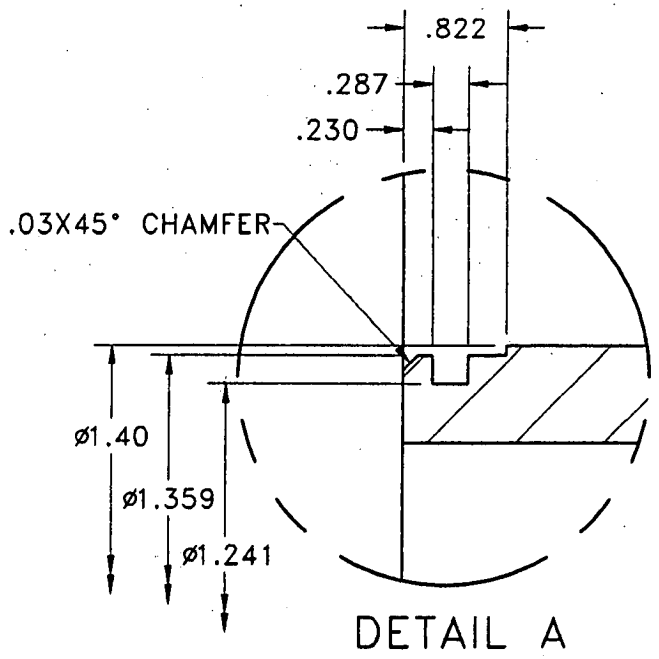


REVISIONS		EP024-01	
SYM.	DESCRIPTION	DATE	BY









DETAIL A

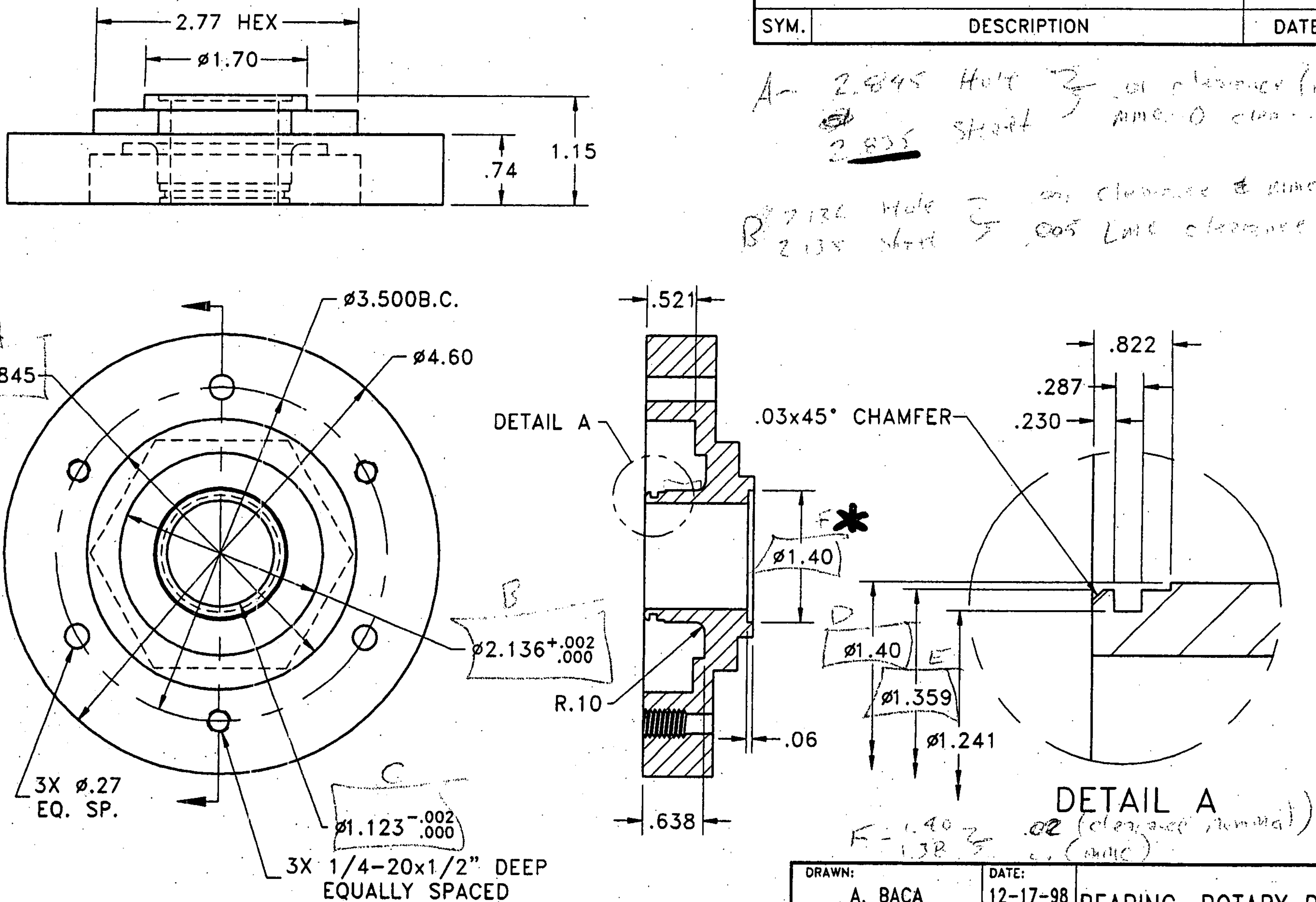
NOTES:
1. HIDDEN LINES OF B.C. HOLES IN TOP VIEW OMITTED TO PROVIDE CLARITY.

DRAWN: A. BACA	DATE: 12-17-98	BEARING, ROTARY DAMPER, DASHPOT	
CHK:	DATE: 12-17-98		
MAT.			
NEXT ASSEMBLY		COXREELS 6720 S. CLEMENTINE CT. TEMPE, AZ 85283 602-820-6396	
DEC. .XX ±.010 .XXX ±.005	FRACT. ±1/32	ANGLE ±.5 DEG.	DWG. NO. EP024-01 REV.

REVISIONS			EP024-01
SYM.	DESCRIPTION	DATE	BY

A – 2.845 Hole ≥ .01 clearance (nominal)
2.835 Shaft ≥ MMC 0 clearance

B – 2.136 Hole ≥ .001 clearance & MMC
2.135 Shaft ≥ .005 LMC clearance



F – 1.40 ≥ .02 (clearance nominal)
1.38 ≥ (MMC)

C – 1.123 Hole = .003 interference (nominal) & MMC
1.125 Shaft ≤ .005 interference (LMC)

NOTES:
1. HIDDEN LINES OF B.C. HOLES IN TOP VIEW OMITTED TO PROVIDE CLARITY.

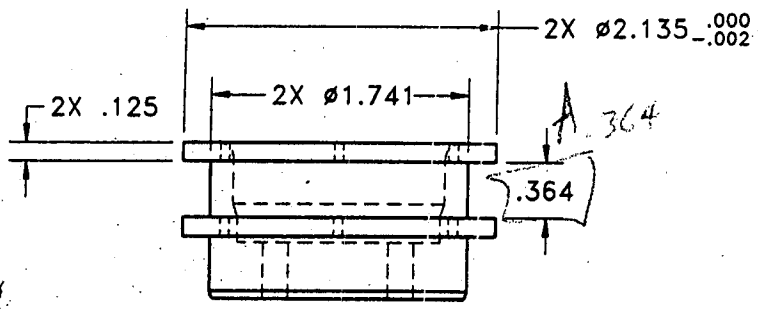
D – 1.40 Shaft ≥ .03 nominal clearance
1.43 Hole ≥ .01 MMC clearance

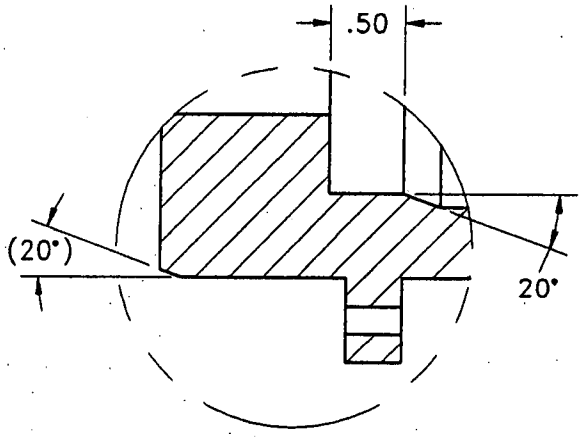
E – 1.359 shaft ≥ .012 clearance (nominal)
1.371 Hole ≥ .002 clearance (MMC)

DRAWN: A. BACA	DATE: 12-17-98	BEARING, ROTARY DAMPER, DASHPOT
CHK:	DATE: 12-17-98	
MAT.		COXREELS 6720 S. CLEMENTINE CT. TEMPE, AZ 85283 602-820-6396
NEXT ASSEMBLY		
DEC. .XX ±.010 .XXX ±.005 / FRACT. ±1/32 / ANGLE ±.5 DEG.		DWG. NO. EP024-01 REV.

PRINTED: 01/15/99 07:20:56 C:_Andre\New Projects\EP-024\EP024-01.DWG

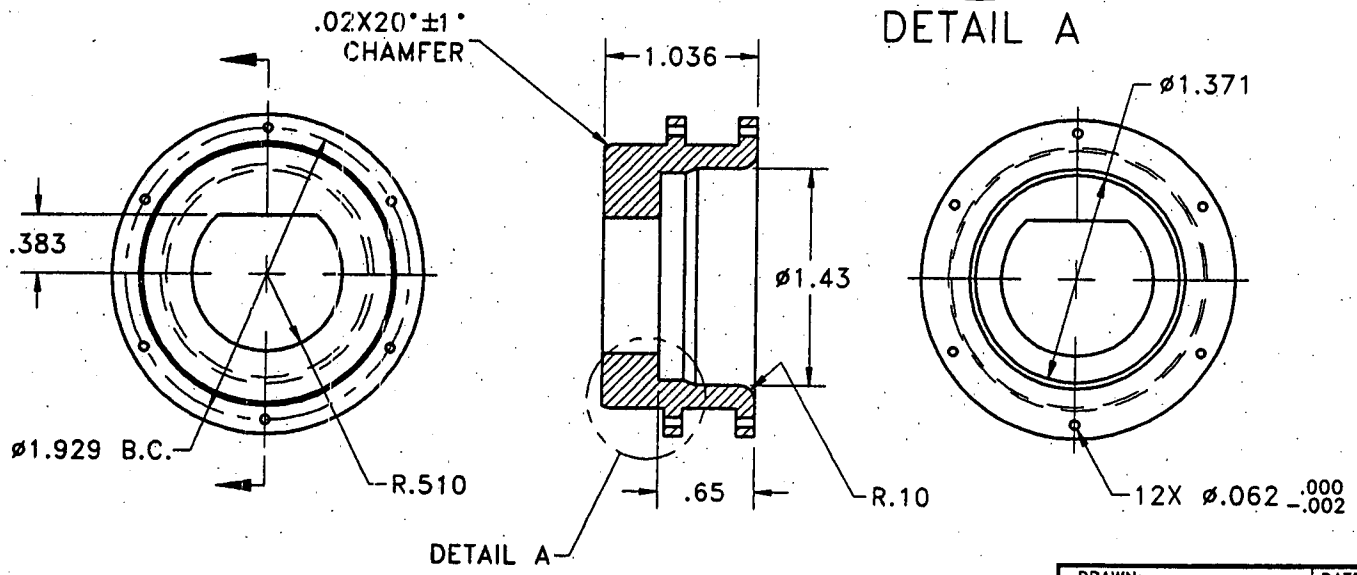
REVISIONS		EP024-03	
SYM.	DESCRIPTION	DATE	BY





DETAIL A

A .364 Finish
.364 Shaft



DRAWN: A. BACA	DATE: 12-17-98	SPOOL, ROTARY DAMPER, DASHPOT	
CHK:	DATE: 12-17-98		
MAT.		COXREELS 6720 S. CLEMENTINE CT. TEMPE, AZ 85283 602-820-6396	
NEXT ASSEMBLY			
DEC. .XX ±.010 .XXX ±.005	FRACT. ±1/32	ANGLE ±.5 DEG.	DWG. NO. EP024-03 REV.

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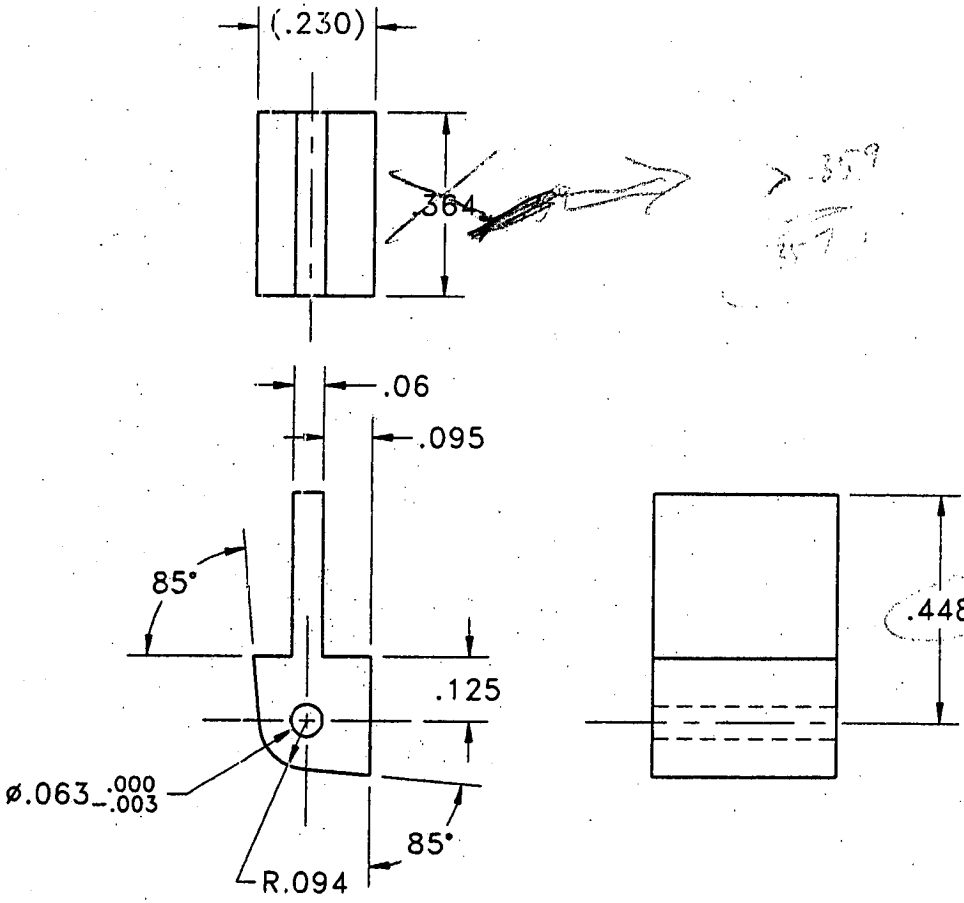
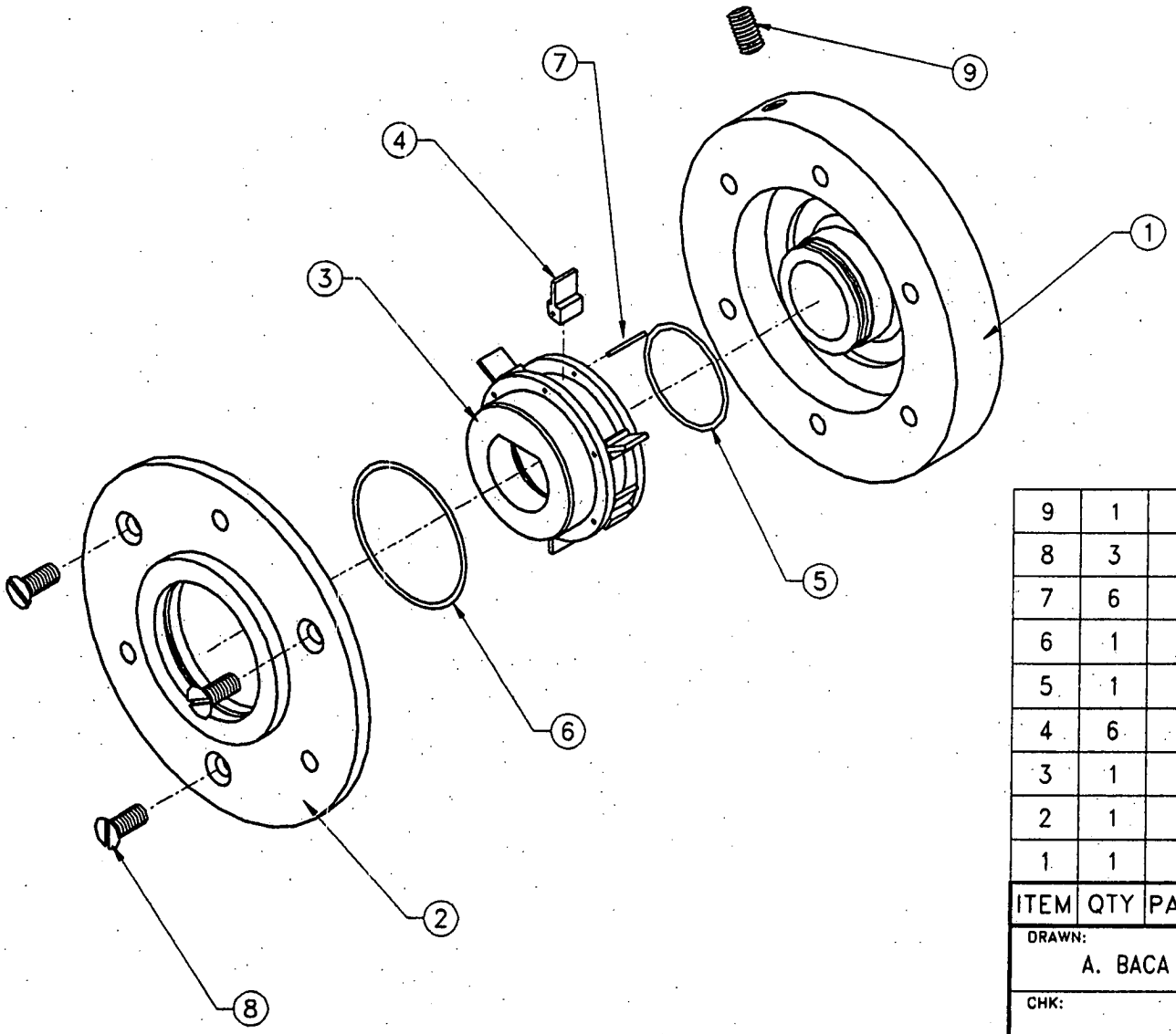
REVISIONS		EP024-04	
SYM.	DESCRIPTION	DATE	BY



.448
½(.929)
1.4125
Ø 2.925 shaft
Ø 2.935 Hole
.01 – clearance (minimal)

DRAWN: A. BACA	DATE: 12-17-98	VANE, ROTARY DAMPER, DASHPOT	
CHK:	DATE: 12-17-98		
MAT.		COXREELS 6720 S. CLEMENTINE CT. TEMPE, AZ 85283 602-820-6396	
NEXT ASSEMBLY			
DEC. .XX ±.010 .XXX ±.005	FRACT. ±1/32	ANGLE ±.5 DEG.	DWG. NO. EP024-04 REV.

REVISIONS		EP024-05	
SYM.	DESCRIPTION	DATE	BY



ITEM	QTY	PART NUMBER	DESCRIPTION
9	1		FILL PLUG
8	3		SCREW, COUNTERSINK, ¼-20 x ½" LG.
7	6		ROLL PIN, 1/16 x ½"
6	1		OUTER SEAL
5	1		INNER SEAL
4	6	EP024-04	VANE
3	1	EP024-03	SPOOL
2	1	EP024-02	COVER
1	1	EP024-01	BEARING

DRAWN: A. BACA	DATE: 12-22-98	ASSY., ROTARY DAMPER, DASHPOT
CHK:	DATE: 12-22-98	
MAT.		COXREELS 6720 S. CLEMENTINE CT. TEMPE, AZ 85283 602-820-6396
NEXT ASSEMBLY		
DEC. .XX ±.010 .XXX ±.005 / FRACT. ±1/32 / ANGLE ±.5 DEG.		DWG. NO. EP024-05 / REV.

C XREELS

Telefax Cover Sheet

Date: 12/04/98 9:54 AM

Telefax #: (702) 826-8449

Company: Ace Controls

RFQ#

Attention: Robert Payne

Pages (includingcover): 1 of 2

Message:

We have been doing some investigation of the use of a damper for our hose reels. Using a belt, chain or friction drive will never work, because the damper would run too fast. I think the only way it will work is to build a damper into our main bearing assembly. I have included a drawing f the space available and the kind of configuration that may work.

Would you be interested in working with us on such a design? I would need some idea of cost on such a product. If it can be done economically, we can use it on many more products than we had originally anticipated. The total quantities could run as high as 40,000 to 50,000 per year.

Please give me your thoughts on this.

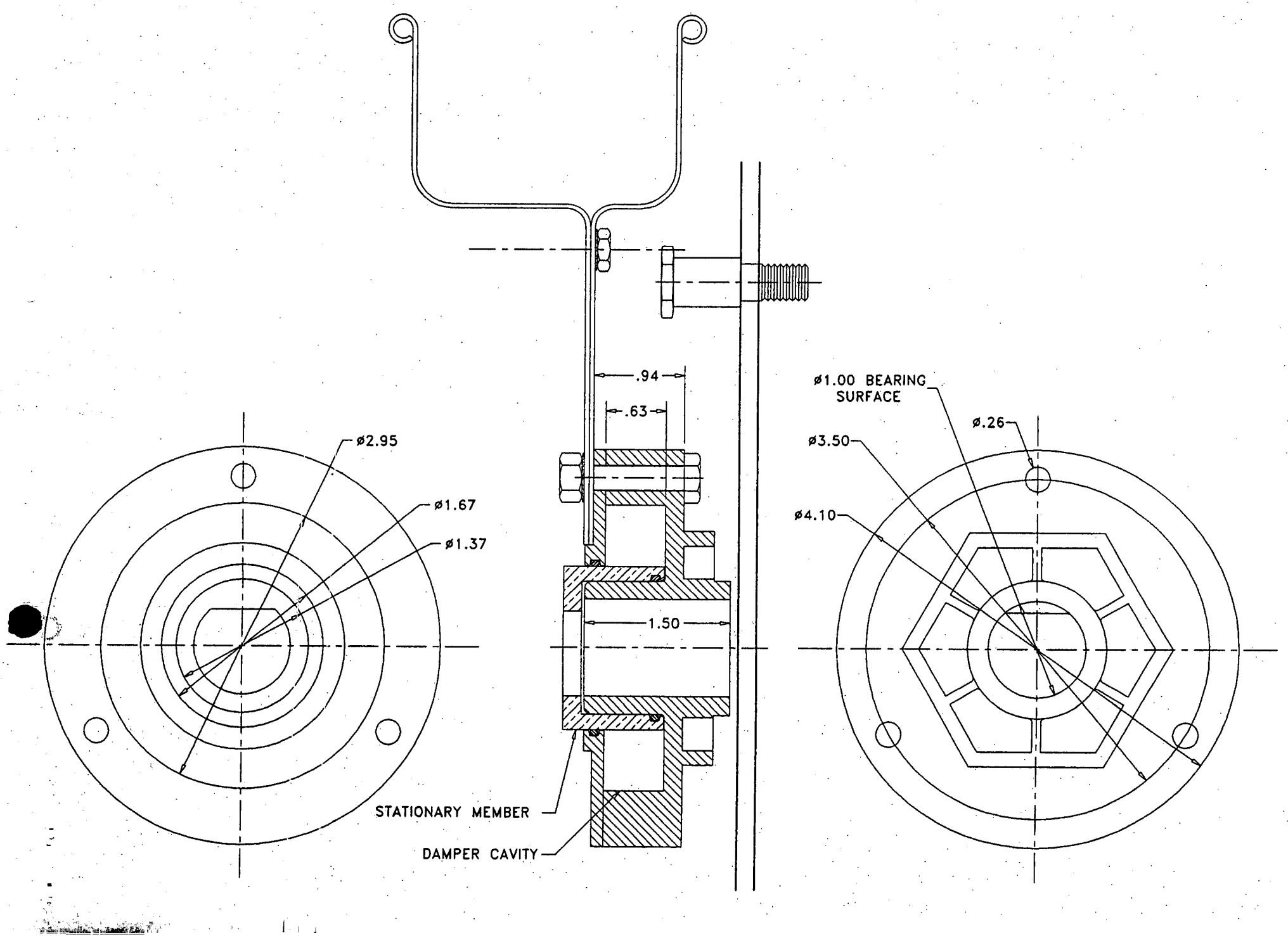
Thank you,

Jerry Sauder

CC: Rick Christian
Reply Requested: Yes ☒ No ☐

Sender Name and Title: Jerry Sauder Design Engineer

6720 S. Clementine Ct., Tempe, Az. 85283 PH: 602-820-6396 - 1-800-269-7335 FAX: 602-820-7011


ø2.95
ø1.67
ø1.37
.94
.63
1.50
STATIONARY MEMBER
DAMPER CAVITY
ø1.00 BEARING SURFACE
ø.26
ø3.50
ø4.10

ACE controls inc.

World leader in deceleration technology

To:	COXRELLS	**From:**	Robert D. Payne
Attn:	Jerry Sauder	**Date:**	December 4, 1998
# Pages:	1	**Fax #:**	
Phone: 702-826-8449 Fax: 702-826-8449 E Mail: Acewrgn@aol.com			

Jerry:

I have received your Fax dated 12/4/1998.

We are interested in reviewing your application using our rotary dampers. I will be at the factory December 14 & 15th and will sit down with our application engineers and review it with them. Until then I am not in a position to say what can be done. What would be helpful is what controlled RPM would you be looking for. If you have any thoughts of how we might incorporate it into the bearing assembly would be helpful and a target price, let me know before the 14th.

Thank you for your time interest,

Bob Payne

9-11

cc: Rick Christian

COXREELS

Telefax Cover Sheet

Date: 12/08/98 7:14 AM

Telefax #: (702) 826-8449

Company: Ace Controls

RFQ#

Attention: Robert Payne

Pages (includingcover): 1 of 1

Message:

I received your Fax of 12/4/98 regarding limiting the rewind speed of our reels.

The speed of the rewind should be limited to approximately 50-60 rpm. That would be about 9-11 seconds to rewind a 25 ft reel and that is about what we want. If we go with a vane typ damper the vanes would have to be mounted on the stationary member. And of course, th dampening will have to be in one direction only. We will use some with reverse rotation.

As far as cost is concerned, we are not yet in a position to say. Right now we are just looking at possible solutions and will try to determine what can be done and to get some idea of costs. Then we will determine the direction we want to go.

Thank you,

Jerry Sauder

CC: Rick Christian

Reply Requested: Yes ☐ No ☐

Sender Name and Title: Jerry Sauder Design Engineer

6720 S. Clementine Ct., Tempe, Az. 85283 PH: 602-820-6396 - 1-800-269-7335 FAX: 602-820-7011

COXREELS

Telefax Cover Sheet

Date: 01/18/99 1:51 PM

Telefax #: 275-9131

Company: A&I Integrated Systems

RFQ#

Att ntion: Brian

Pages (includingcover): 1 of 2

Message:
Ref: Ace rotary dampers

Brian,
Enclosed is a listing of torque ratings for a number of our springs for you to forward to Ace. I h pe this information is helpful.
Please see what you can do about getting us a sample of a rotary damper.

Thank you,

R ply Requested: Yes ☐ No ☐

S nder Name and Title: Jerry Sauder Design Engineer

6720 S. Clementine Ct., Tempe, Az. 85283 PH: 602-820-6396 - 1-800-269-7335 FAX: 602-820-7011

Torque Tubes

	0.04	X	1	X	40'	84.92
	0.04	X	1	X	30'	89.36
	0.04	X	1	X	20'	103.70
	0.04	X	1	X	15'	99.74
	0.04	X	1	X	48'	80.63
NOT A STANDARD	0.055	X	1	X	25'	227.76

6.53 (18 Turns)
8.93 (12 Turns)
14.14 (8 Turns)
19.95 (5 Turns)
5.38 (22 Turns)
28.47 (10 Turns)

1958-3 = .040 x 1 x 30'

EP024 - Clutch system for limiting retraction speed.
Design proposal.
1/19/99

In studying the problem of limiting the retraction speed for spring return reels, it seems that the most practical solution is a rotary damper built into the molded plastic bearing. It would consist of the outer bearing housing, a cover, a stator and a number of vanes. All of these parts could be molded from plastic with little or no machining. It could be used on all reels with or without locking rings and with various spring torques. The action of a rotary damper seems to be just what we are looking for. It would allow free motion at low speeds, but the resisting torque would increase as the speed increases. When the resistance of the device balances the spring torque, the reel would reach the limiting speed and would go no faster. The device could be designed so there would be little or no restriction while extending the hose.

The device would be a rotary dashpot with a chamber filled with a viscous fluid that would rotate with the reel and a stationary stator (keyed to the shaft) to which vanes are attached that would operate inside the fluid filled chamber. The vanes would be hinged so the restriction would only be in the direction of retraction. The fluid would be retained in the chamber by 2 rotary o-ring seals. The resisting torque could be varied by 1) changing the number of vanes, 2) varying the viscosity of the fluid or 3) putting holes of various sizes in the vanes to control the passage of the fluid. Dow-Corning makes silicone fluids of different viscosities that can be interchanged or mixed to get the exact viscosity we need.

We have talked to Ace Controls, who make rotary dampers, about working with us to develop such a device and they did express an interest in doing so. Their engineers are looking at the application, but have not yet come up with any concrete suggestions. It would be very valuable to partner with someone who has experience in this very narrow, specialized field. If we were to develop it ourselves, it would take a lot of experimentation, since we have no experience in this area.

Prepared by Jerry Sauder

Ace Controls
Engineering contact
Paul Rienhold – applications engineer
(800) 521-3320
Extension #617

On March 5 Brian Riecks of A&I Integrated Systems (Ace distributor) called. Ace gave us a price of $65 per unit for them to build a rotary damper unit for us. He said if this was out of our range, he would not bother to type up a formal quotation. I told him "don't bother".

March 8, 1999
EP024 Rotary damper
Progress report

We have assembled our first prototype and have done some experimentation with it. It definitely slowed down the retraction speed considerably, but not enough. By studying the fluid flow characteristics through the clear plastic window, we determined that a multiple disc system would work better than the retractable vanes. We can use a one way bearing to completely unload the force as the hose is pulled out, but will lock and provide a drag when the hose retracts. The shear of the fluid between the discs (a space of .005-.010 inch) will provide the drag. We have also ordered a higher viscosity fluid, which will give us a better control of the amount of drag exerted.

We can build a prototype of the modified design by reworking the housing and making a new spindle and discs. The cover and seals will not change.

March 17, 1999

CMD is making the housing spindle and bronze bushing. We should have them this week.
Lynndale Stainless is laser cutting the discs. They will finish them in 4-5 days after they receive the material.
I talked to Dow Corning about the silicone fluid. He will stop by next week to see our application. The silicone comes in an 8-pound container. If bought in lots of 4 the cost of a container of 500 cs. fluid is $28, of 30,000 cs. is $75. We estimate that we can fill approximately 2,000 units per 8# container.

March 19, 1999
EP024 Rotary damper
Progress report

We received all the machined parts from CMD yesterday. The material for the discs went to Lynndale Stainless today for laser cutting. Andre made the shim spacers. The roller clutch is here. The shaft is being heat treated by Phoenix Heat treat and will be welded as soon as it comes back. A grease gun, grease fittings and 1/8" pipe plugs were ordered from McMaster-Carr for inserting and retaining the silicone fluid. We should have everything here by the end of next week so we can assemble the unit and resume testing.

We plan to assemble the unit with the maximum number of discs (6 of each) and charge it with 500 cs. silicone fluid. We will adjust the number of discs and the fluid viscosity according to the results that we get from the testing.

Prepared by: Jerry Snyder

April 12,1999
EP024 Rotary damper
Progress report

We have completed a second damper unit so we now have 2 units for testing. We have determined that we will have to have several assemblies to cover the torque range of our springs. The 1449 reel requires 4 shear surfaces and the 30,000 cs. viscosity fluid. We found that it also works well with 14 shear surfaces and 2,000 cs. viscosity fluid (a mix). The TSH-N-3100 and MP-N-450 require 14 shear surfaces (the maximum) and 30,000 cs. fluid. It may work best to keep the 14 shear surfaces for everything and vary the fluid viscosity for the different models. We have determined experimentally that we will not need to dimple the discs for spacing. This will prevent binding due to the distortion introduced during the dimpling process and assure a smoother operation.

We also tested the SD-50 reel. Because of the lower torque on the spring, we will need a lower viscosity fluid than on the other units. With the 500 cs. fluid and 14 shear surfaces it seems just about right.

We are working on getting lower prices on the spool, roller clutch and moldings. We have found another source of the silicone fluid, which has many more different viscosities available. This is good because we will not have to mix fluids to get the viscosity we need.

Prepared by Jerry Sauder

April 27,1999
EP024 Rotary damper
Progress report

We have determined that we can use the higher viscosity (30,000cs.) fluid on all of the reels except the SD reels by varying the number of active discs. If we change to the .040 x 1" spring, we can also use it on the SD reels. The higher viscosity fluid has a flatter temperature/viscosity curve, therefore is less affected by temperature extremes. The damper will work well throughout our temperature range of 0°F to 120°F. On the test on the 1449 reel the average retraction speed was: at 11°F – 1.3 ft/sec, at 77°F – 4.2 ft/sec, at 125°F – 5 ft/sec.

We are presently having 4 sets of parts of our latest design made, in order to do more testing on different reels and do some endurance testing.

Prepared by Jerry Sauder

May 4,1999
EP024 Rotary damper
Progress report

4 prototype dampers are being made to our latest design. We will incorporate a delrin housing and cover, an aluminum spool and o-ring seals. We are continuing out research to lower the cost of the unit and still maintain the quality. We have found some alternate sources of silicone fluid that are much more economical. We can get a GE fluid for $2.39/lb. as opposed to about $62.00/lb. for Dow-Corning.

We received a price on the spool as a powered metal part for $.80 as opposed to $4.10 as a machined part. The only potential problem with the PM part is that they cannot hold the tolerances we asked for but we may be able to modify our design in such a way that they would be acceptable. One possibility we are looking at is to use "lip" type seals in place of the o-ring seals. That would allow a little more eccentricity but would probably add about $2.00 to the cost. The best price we have received on the plastic moldings is from a company in PA that we have had no experience with.

Prepared by Jerry Sauder

COXREELS

Telefax Transmittal Cover Letter

Date: 03/24/99 10:42 AM

Telefax #: 602-654-7011

C mpany: Arizona Plastic Molding Inc.

Subject: Quote

Att ntion:

Pages (includingcover): 1 of 3

Message:

To Whom It May Concern:

I have a new design which these two parts (see attached drawings) are to be used. In an attempt to keep costs down, I would like to mold these parts from plastic rather than have them machined. The quantity of these items is unknown at this point but we anticipate 800 monthly with the potential of 4000. I am unsure of the proper material from which they are to be molded. The tolerances are rather tight and to maintain these tolerances surely would contribute to the type of material selected as would, of course, the functionality. Would you overlook these drawings and see if there is potential in such a design and roughly a price range in which it may fall. I realize there may be several questions you may hav regarding the functionality of these parts, so please don't hesitate to call.

Thank you,

Reply Requested: Yes ☒ No ☐

Sender Name and Title: André J. Baca Engineer/Cad Design

6720 S. Cl mentine Ct., Tempe, Az. 85283 PH: 602-820-6396 - 1-800-269-7335 FAX: 602-820-5132

C XREELS

Telefax Transmittal Cover Letter

Date: 03/24/99 10:43 AM

Telefax #: 602-654-7011

Company: Tooling Mold West, Inc.

Subject: Quote

Attention:

Pages (includingcover): 1 of 3

Message:

To Whom It May Concern:

I have a new design which these two parts (see attached drawings) are to be used. In an attempt to keep costs down, I would like to mold these parts from plastic rather than have them machined. The quantity of these items is unknown at this point but we anticipate 800 monthly with the potential of 4000. I am unsure of the proper material from which they are to be molded. The tolerances are rather tight and to maintain these tolerances surely would contribute to the type of material selected as would, of course, the functionality. Would you overlook these drawings and see if there is potential in such a design and roughly a price range in which it may fall. I realize there may be several questions you may have regarding the functionality of these parts, so please don't hesitate to call.

Thank you,

Reply Requested: Yes ☒ No ☐

Sender Name and Title: André J. Baca Engineer/Cad Design

6720 S. Clementine Ct., Tempe, Az. 85283 PH: 602-820-6396 - 1-800-269-7335 FAX: 602-820-5132

COXREELS

Telefax Transmittal Cover Letter

Date: 03/24/99 10:42 AM

Telefax #: 602-654-7011

Company: SRG Plastics

Subject: Quote

Attention:

Pages (includingcover): 1 of 3

M ssage:

To Whom It May Concern:

I have a new design which these two parts (see attached drawings) are to be used. In an attempt to keep costs down, I would like to mold these parts from plastic rather than have them machined. The quantity of these items is unknown at this point but we anticipate 800 monthly with the potential of 4000. I am unsure of the proper material from which they are to be molded. The tolerances are rather tight and to maintain these tolerances surely would contribute to the type of material selected as would, of course, the functionality. Would you overlook these drawings and see if there is potential in such a design and roughly a price range in which it may fall. I realize there may be several questions you may have regarding the functionality of these parts, so please don't hesitate to call.

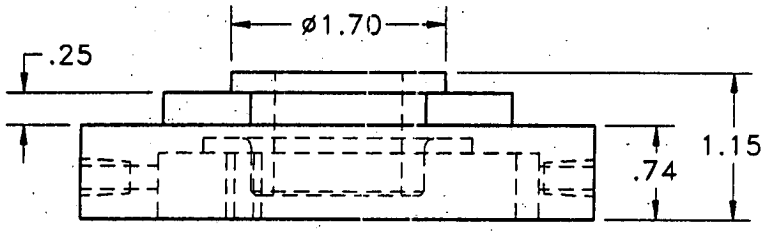
Thank you,

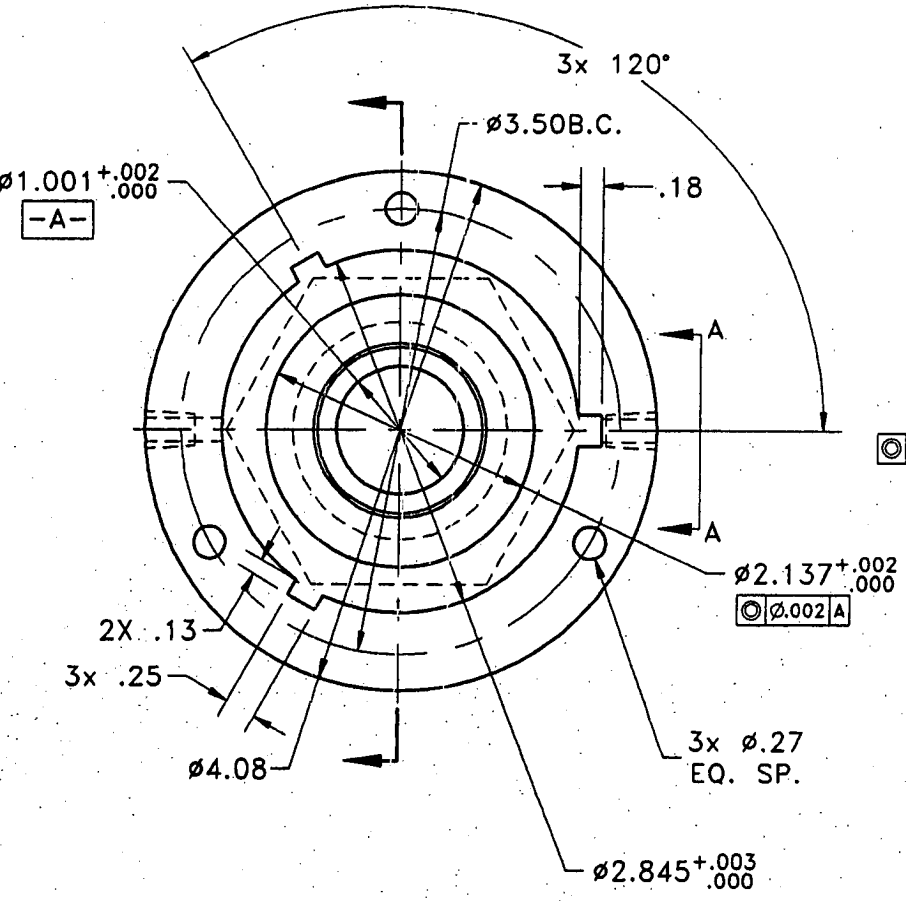
Reply Requested: Yes ☒ No ☐

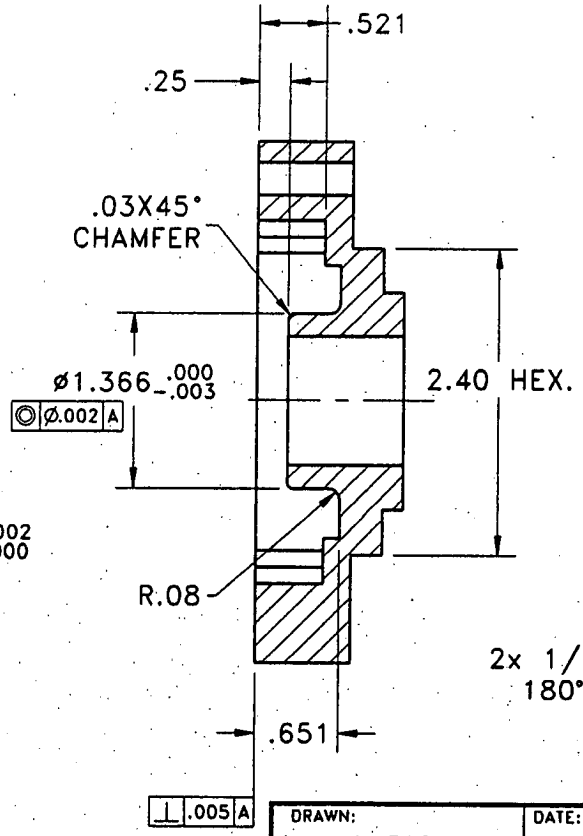
Sender Name and Title: André J. Baca Engineer/Cad Design

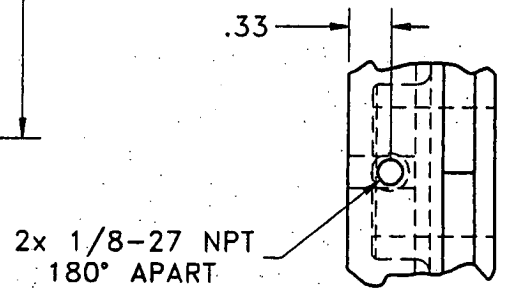
6720 S. Clementine Ct., Tempe, Az. 85283 PH: 602-820-6396 - 1-800-269-7335 FAX: 602-820-5132

REVISIONS		EP024-01	
SYM.	DESCRIPTION	DATE	BY







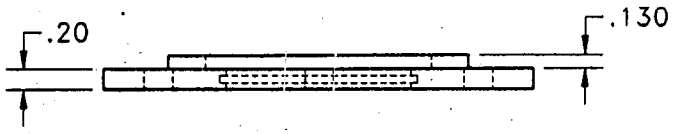


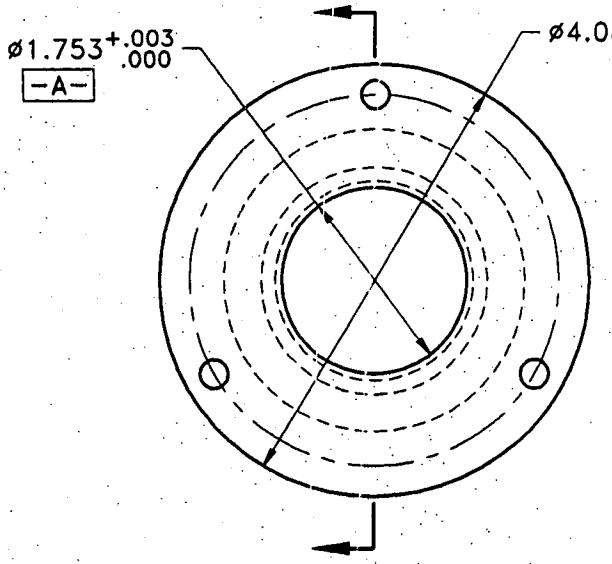
VIEW A-A

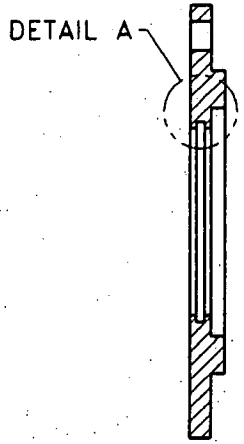
NOTES:
1. HIDDEN LINES OF B.C. HOLES IN TOP VIEW OMITTED TO PROVIDE CLARITY.

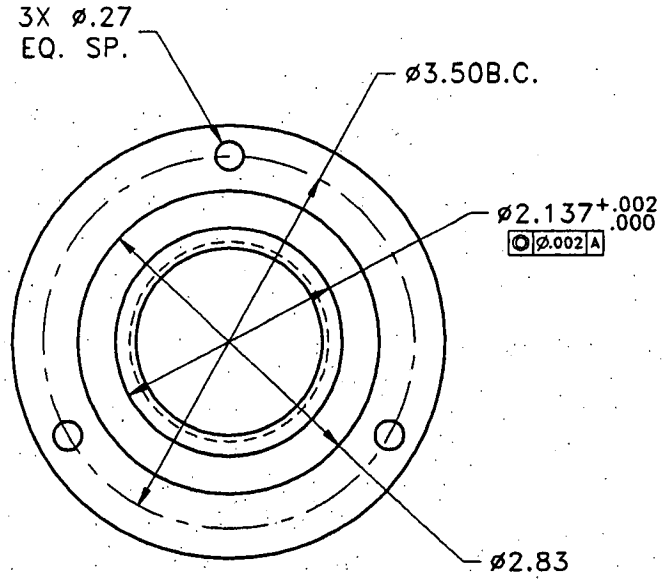
DRAWN: A. BACA	DATE: 3-23-99	HOUSING, BEARING, INJECTION MOLDED	
CHK: J. SAUDER	DATE: 3-23-99		
MAT.			
NEXT ASSEMBLY		COXREELS 6720 S. CLEMENTINE CT. TEMPE, AZ 85283 602-820-6396	
DEC. .XX ±.010 .XXX ±.005	FRACT. ±1/32	ANGLE ±.5 DEG.	DWG. NO. EP024-01 REV.

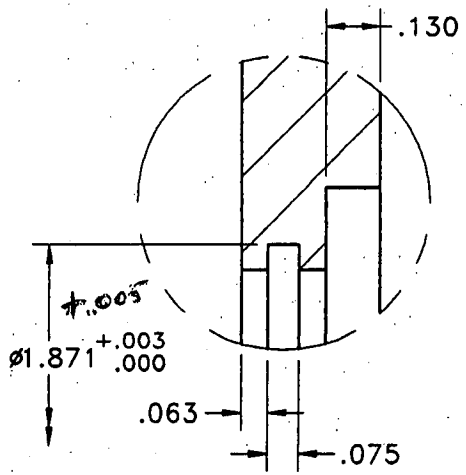
REVISIONS		EP024-02	
SYM.	DESCRIPTION	DATE	BY







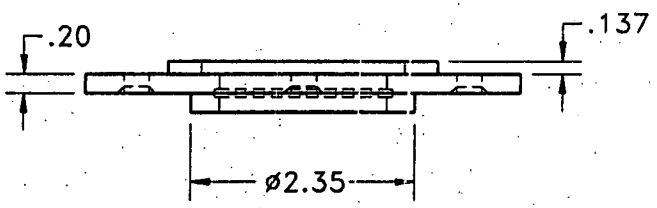


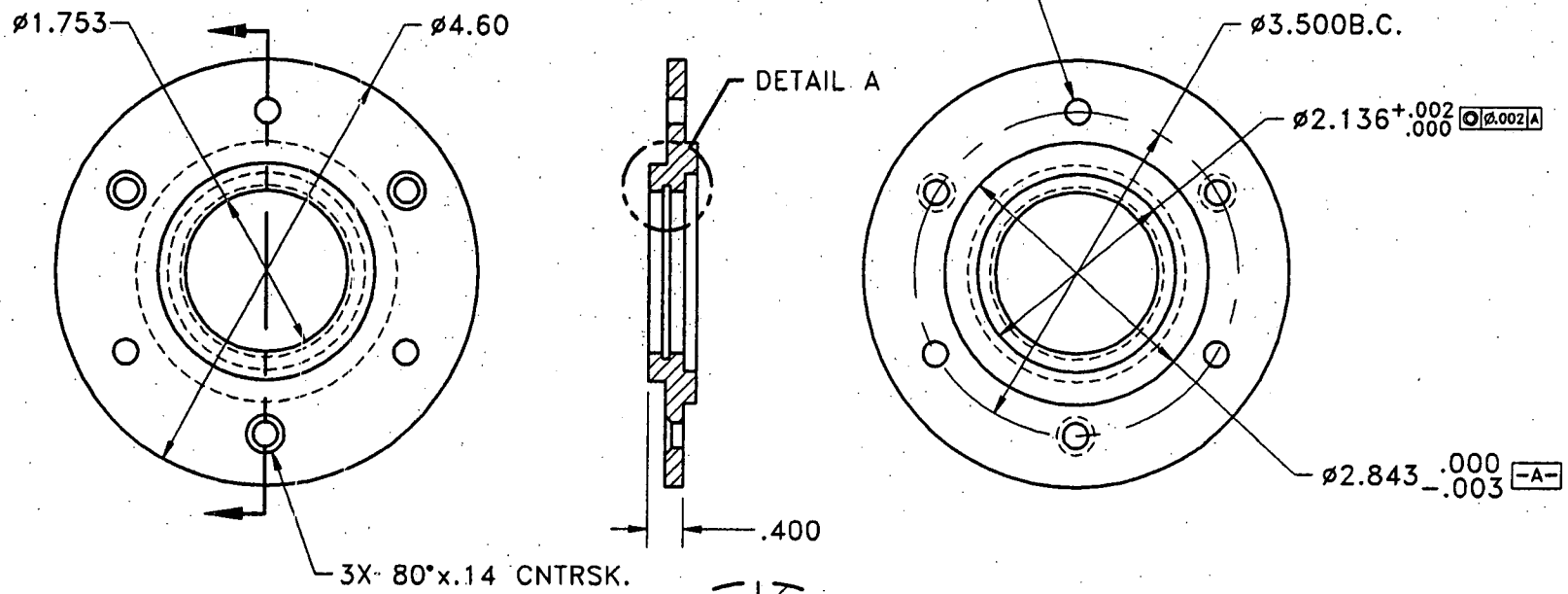


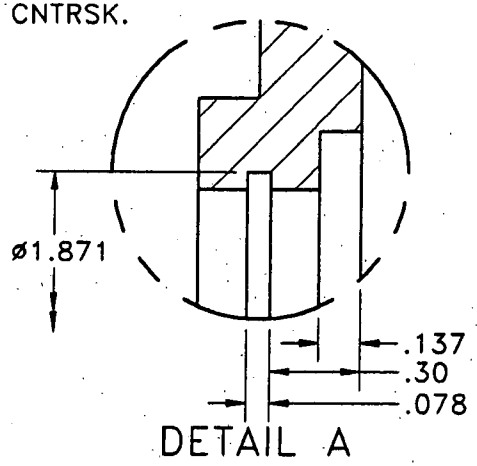
DETAIL A

DRAWN: A. BACA	DATE: 3-23-99	COVER INJECTION MOLDED	
CHK: J. SAUDER	DATE: 3-23-99		
MAT.			
NEXT ASSEMBLY		COXREELS 6720 S. CLEMENTINE CT. TEMPE, AZ 85283 602-820-6396	
DEC. .XX ±.010 .XXX ±.005	FRACT. ±1/32	ANGLE ±.5 DEG.	DWG. NO. EP024-02 REV.

REVISIONS		EP024-02	
SYM.	DESCRIPTION	DATE	BY

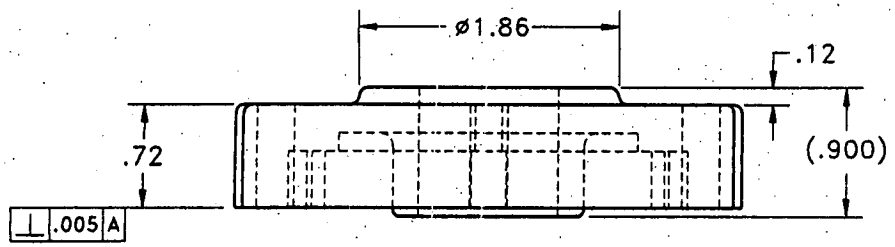


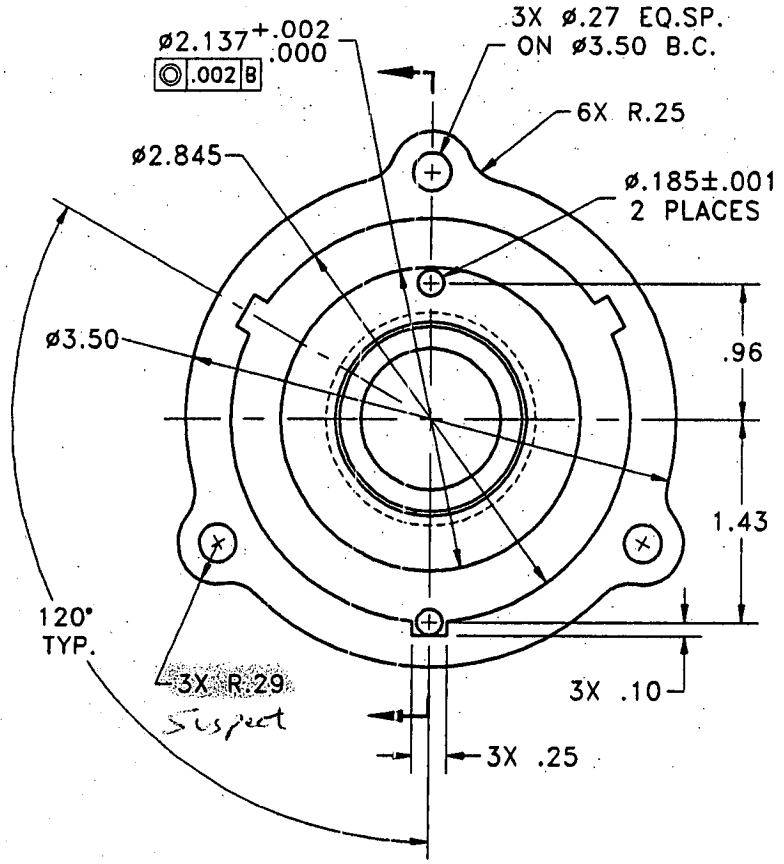


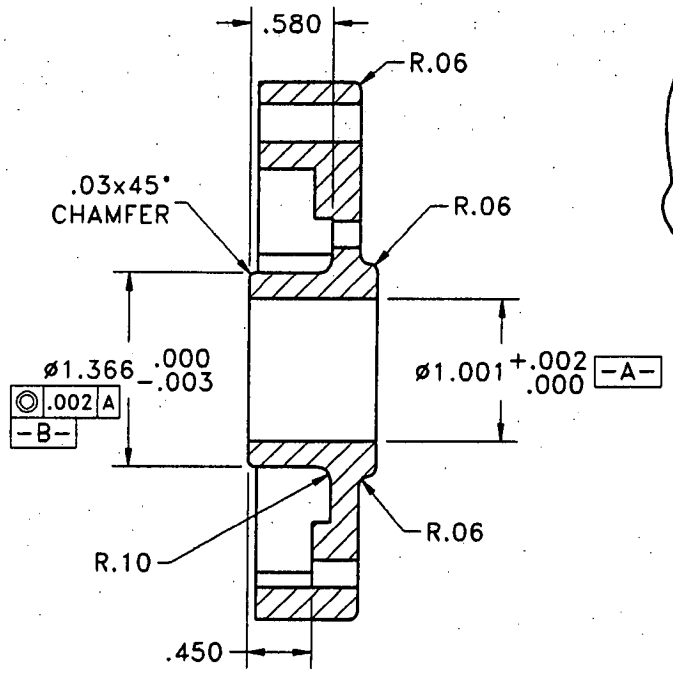


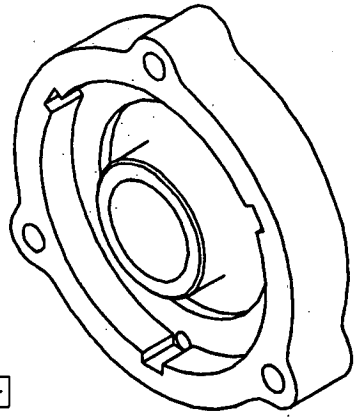
DRAWN: A. BACA	DATE: 2-01-99	COVER, ROTARY DAMPER, DASHPOT	
CHK: J. SAUDER	DATE: 2-01-99		
MAT. LEXAN (CLEAR)		COXREELS 6720 S. CLEMENTINE CT. TEMPE, AZ 85283 602-820-6396	
NEXT ASSEMBLY EP024-06			
DEC. .XX ±.010 .XXX ±.005	FRACT. ±1/32	ANGLE ±.5 DEG.	DWG. NO. EP024-02 REV.

REVISIONS		EP024-01	
SYM.	DESCRIPTION	DATE	BY



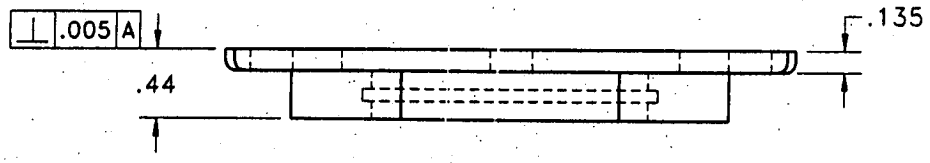


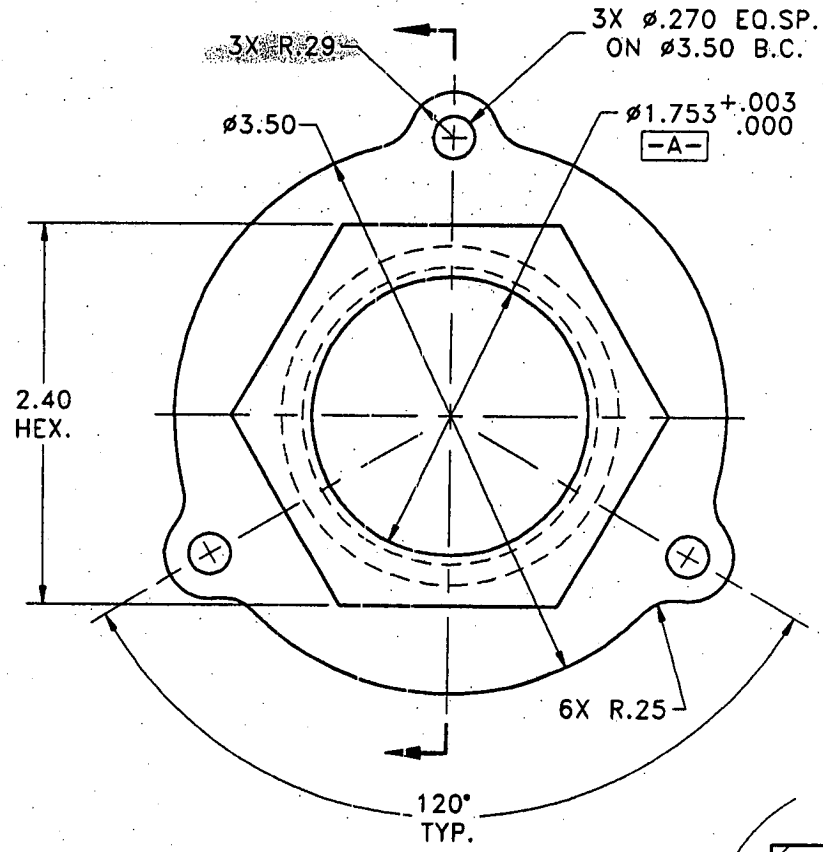


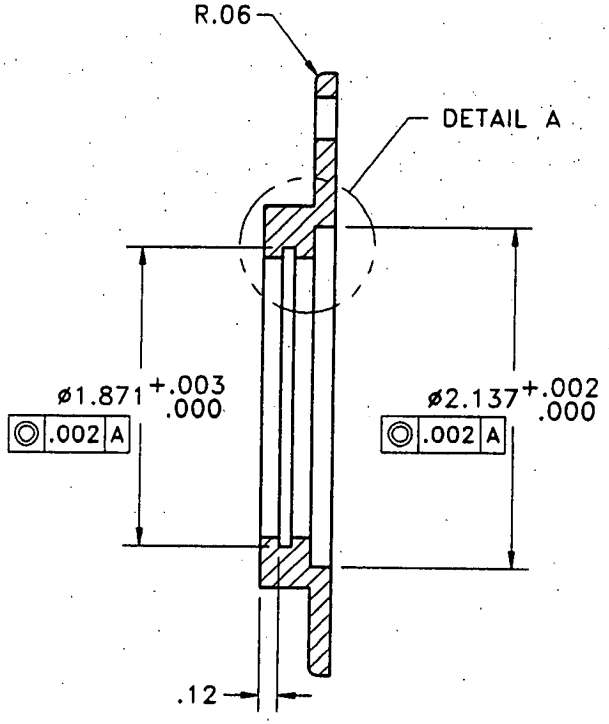


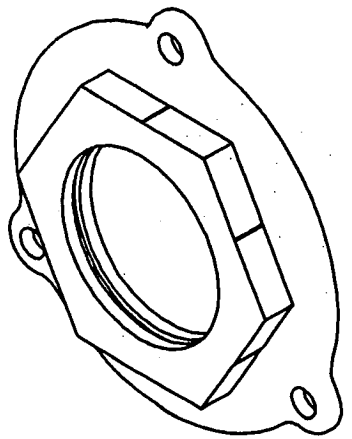
DRAWN: A. BACA	DATE: 3-25-99	HOUSING, BEARING INJECTION MOLDED	
CHK: J. SAUDER	DATE: 3-25-99		
MAT. 30% GLASS POLYCARBONATE		COXREELS	
NEXT ASSEMBLY		6720 S. CLEMENTINE CT. TEMPE, AZ 85283 602-820-6396	
DEC. .XX ±.010 .XXX ±.005	FRACT. ±1/32	ANGLE ±.5 DEG.	DWG. NO. EP024-01 REV.

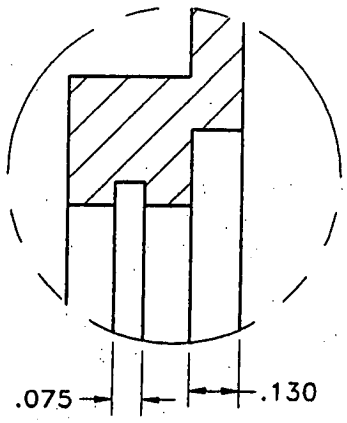
REVISIONS		EP024-02	
SYM.	DESCRIPTION	DATE	BY







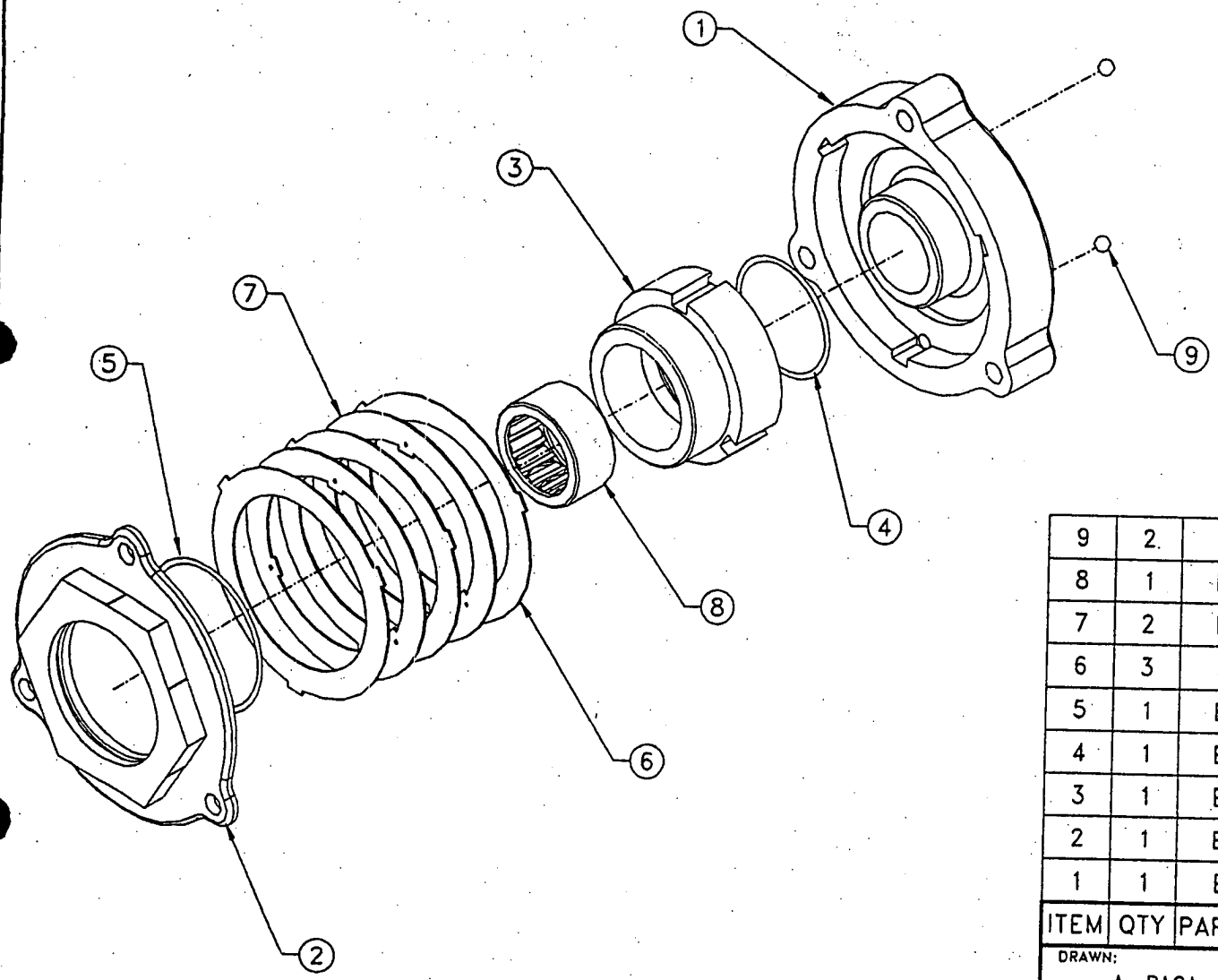




DETAIL A

DRAWN: A. BACA	DATE: 3-26-99	COVER	
CHK: J. SAUDER	DATE: 3-26-99		
MAT. 30% GLASS POLYCARBONATE			
NEXT ASSEMBLY		COXREELS 6720 S. CLEMENTINE CT. TEMPE, AZ 85283 602-820-6396	
DEC. .XX ±.010 .XXX ±.005	FRACT. ±1/32	ANGLE ±.5 DEG.	DWG. NO. EP024-02 REV.

REVISIONS		EP024-16	
SYM.	DESCRIPTION	DATE	BY



ITEM	QTY	PART NUMBER	DESCRIPTION
9	2	EP024-15	FILL PLUG, SPHERICAL
8	1	EP024-14	CLUTCH, ROLLER
7	2	EP024-12	VANE, STATIONARY
6	3	EP024-11	VANE, ROTARY
5	1	EP024-08	SEAL, OUTER
4	1	EP024-07	SEAL, INNER
3	1	EP024-03	SPOOL
2	1	EP024-02	COVER
1	1	EP024-01	BEARING, HOUSING

NOTES:
1. PRESS CLUTCH INTO SPOOL PRIOR TO FINAL ASSEMBLY.
2. APPLY A THIN COAT OF ADHESIVE TO HOUSING FACE AND ALLOW COVER TO CENTER ITSELF ON SPOOL. ADHERE COVER TO HOUSING.
3. FILL DASHPOT WITH 30,000 CS SILICONE FLUID AND PRESS FILL PLUGS INTO HOLES.

DRAWN: A. BACA	DATE: 3-29-99	ASSEMBLY, ROTARY DAMPER	
CHK: J. SAUDER	DATE: 3-29-99		
MAT.			
NEXT ASSEMBLY		COXREELS 6720 S. CLEMENTINE CT. TEMPE, AZ 85283 602-820-6396	
DEC. .XX ±.010 .XXX ±.005	FRACT. ±1/32	ANGLE ±.5 DEG.	DWG. NO. EP024-16 REV.

COXREELS

MEMO

Date: 03/30/99 2:47 PM

To: Don Cox

Subject: Ep024 - Rotary Damper

From: Jerry Sauder

C.C.: Dave Gorski

Message:
I am enclosing a complete set of drawings of the latest version of our rotary damper. It includes a housing and cover, both molded from glass filled polyester, a spool machined from aluminum and stamped steel discs. Our preliminary discussions with our molders indicate a total cost of approximately $2.50 for the housing and cover and a tooling cost of around $40,000. We will get prices for the discs from some companies that have high-speed presses.

The damper unit consists of a set of discs that are alternately keyed to the rotating housing and to the stationary spool. Therefore, when the housing rotates, there is relative motion between each disc and the disc adjacent to it. By maintaining a controlled space (.005-.010 inches) between each of the discs and filling that space with a viscous fluid, the damping action is created. The fluid is constantly being sheared because the discs are each trying to drag the fluid in opposite directions. The result is a resistive force that will try to slow down the motion. The more shear surfaces we have in the unit, The more resistance there is to the motion. Also, the more viscous the fluid is, the more resistance there is to the motion. Our unit also includes a one-way clutch that completely disengages the damper as the hose is being extended.

There is very little resistance at very slow speeds, but the resistance increases as the speed increases. In our reels, the hose will always retract, but as the speed increases, the resistance to the motion increases. When it reaches the speed at which the resistance of the damper equalizes the pull of the spring, that speed will be maintained until the hose is fully retracted. The speed may slow down some as the hose becomes wound up on the reel, because the spring force is less as the spring unwinds.

We received all of the prototype parts on Friday (3\26/99) and we assembled it to a 1449 reel, using the full compliment of discs (12 shear surfaces) and the 500 cs. fluid. Although the reel was definitely slowed down it still was allowed to reach a speed of approximately 300 rpm (60-70 rpm is optimum). We changed to the more viscous fluid (30,000 cs.). The retraction speed was slowed to about 20 rpm. We began removing the discs one at a time until we had only 4 shear surfaces in contact. At that point we were getting a speed of approximately 70 rpm

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which is about what we want. Although the 4 shear surfaces is right for that small reel, we still have the additional capacity to add several more discs if we should need it for the larger reels. We could also use a fluid with a viscosity somewhere between 500 and 30,000 cs.

Reply Requested: Yes ☐ No ☐

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April 8, 1999

Rotary Dashpot Evaluation:

TSH-N-~~550~~ 3100 14 shear surfaces (max.) / 30,000cs fluid
inconsistent spring torque's causes fairly rapid hose retraction at the beginning of the cycle and fairly slow retraction at the end of the cycle. Mainly caused by the length of the spring (hose). Must find a "happy medium" for greatest advantage.
Verdict?: Just about as good as we can expect with 100ft. of hose. (****)

1449- 2 or 4 shear surfaces / 30,000cs fluid
Hose retraction was consistent and steady (Impressive). No changes necessary.
Verdict?: Perfect. (*****)

SD-50 10 shear surfaces / 500cs fluid
Fairly consistent retraction speed was maintained. Somewhat rapid at the beginning of the cycle and somewhat slow at the end. Mainly caused by the weakness in spring torque. Unforgiving torque – very little room for inconsistencies of damper. 6.07 to 6.93 seconds to retract 50ft. of cable. approx. 7.7 fps average. Re-test with 12 shear surfaces revealed better control of the cable
Verdict?: 10 surfaces was insufficient. 12 surfaces revealed better control. Spring is too weak for dampening of any SD-series reels.
(***)

MP-N-450 14 shear surfaces (max.) / 30,000cs fluid
Fairly consistent retraction speed was maintained. (Similar to the SD-50) Unsure of the reason at this point. Requires further investigation. 10.2 to 12.4 seconds to reel 50ft of hose filled with grease. Approx. 4.4 fps average
Verdict?: Needs a little fine tuning but overall good. (****)

So far it seems as though 5.0 fps average is the ideal retraction speed for all reels. The 75' and 100' length hose reels will be quick at the beginning of the cycle and slow at the end in order to get an average 5.0 fps. However, this will give an overall controlled retraction speed, especially at the end of the cycle where it is most critical. The reels with the weaker springs (SD series) will all need to be dampened using a different viscosity fluid than all the rest of the reels. All other reels will use the 30,000cs fluid.

April 12, 1999

Update: (unformatted)
After numerous trials with 14 shear surfaces, over and over the damper kept binding. The space allowed in the damper was insufficient to accommodate the inconsistent flatness of the rings. We removed the dimples and allowed the rings to stack flat on top of each other. Then we filled the damper. This virtually

eliminated the bindings because the open space that the dimples once occupied was replaced with fluid. The biggest concern in removing the dimples was whether or not each ring would get adequate saturation of the fluid. After removing the damper and opening it up, we discovered that indeed each and every ring was completely saturated with the fluid. Therefore, the dimples (spacers) are unnecessary. This will cut the cost of the damper as well as make the torque more consistent. The fluid viscosity ranges from 500cs to 30,000cs. The 500cs fluid seems to work adequately with the SD-50 (spring needs to be lubed with lubercant (WD-40) instead of grease). The 30,000cs fluid works well with the TSH-N-550 and the MP-N-450. All other reels will fall somewhere in between These two viscosities. The 1449- works well with the 2,000cs fluid (mixed) but perhaps would work best with 3,000cs fluid.

In order to provide dampening for all reel models we probably need to vary the viscosity as well as the number of shear surfaces. We will try to devise a unique graph. The graph will consist of two input variables; the viscosity and the shear surfaces which will provide us with the approximate spring resistance. We will be able to vary the viscosity and/or the number of shear surfaces to give us a retraction speed of approximately 4.00 fps±½fps at 75° F.

EP024 Rotary Damper - Test Results Reel# 1449

Flange diameter	Drum Diameter	Drum width	Hose inside dia	Hose length	Hose type	Maximum spring torque	Spring thickness	Spring width	
13	9	2.88	1/4	25	A/W	89.48	.040	1	

Test number	Date	# of Shear surfaces	Silicone viscosity	Temperature deg. F	Retraction time (sec)	Average retraction speed (ft./sec.)	Comments
1		4	30,000	RT			SPEED SEEMED RIGHT - DID NOT TIME
2		2	30,000	RT			SPEED OK - DID NOT TIME
3		14	2,000	RT-69°	6.54	3.82	
4		14	2,000	12°	12.2	2.05	
5		14	2,000	115°	4.2	6.0	
6	4/21/99	4	30,000	RT 77°	6	4.2	
7	4/22	4	30 K	11°	19	1.3	Slow, but smooth motion
8	4/22	4	30K	127°	5	5	